REMARKS/ARGUMENTS

Reconsideration and continued examination of the above-identified application are respectfully requested.

The amendment to the claims further defines what the applicants regard as the invention. Full support for the amendment can be found throughout the present application, including claims as originally filed, for instance, at pages 11, 15, 20, 23, 26, and claims 3 and 5. Accordingly, no questions of new matter should arise, and entry of the amendment is respectfully requested.

Claims 1-41 are pending in the application. Claim 1 further adds features recited in claims 3 and 5, and claim 41 adds an additional feature from pages 11, 15, 20, 23, and 26 of the specification.

At page 2 of the Office Action, the Examiner rejects claims 1, 3, 4, 8, and 9 under 35 U.S.C. §102(b) as being anticipated by Maley et al. (U.S. Patent No. 5,770,018). According to the Examiner, Maley et al. describes an electrochemical-sensing apparatus comprising conductive modified particles, such as electrically-conducting carbon or graphite powder particles, having at least one organic group attached to the particles. Additionally, the Examiner states that Maley et al. describes the use of carbon black materials and carbon particles that may include a metal substrate layer coating having platinum. Furthermore, the Examiner states that Maley et al. describes an aggregate having carbon or graphite particles and finely divided platinum group metal either deposited or adsorbed onto the carbon or graphite particles, which is equivalent to an aggregate having a carbon phase and a metal-containing phase. For the following reasons, this rejection is respectfully traversed.

Independent claims 1, 19, 22, and 38 each recite, in part, "wherein said conductive modified particles comprise carbon products or colored pigments having attached at least one organic group, aggregates comprising a carbon phase and a silicon-containing species phase and optionally having

attached at least one organic group, aggregates comprising a carbon phase and metal-containing species phase optionally having attached at least one organic group, silica-coated carbon blacks, or combinations thereof." Furthermore, claim 41 recites, in part, that the conductive particles have at least one organic group directly attached to the particles.

Maley et al. relates to an electrochemical sensor having an electrically nonconductive substrate, a working electrode, and a semi-permeable membrane covering the working electrodes. Maley et al., at column 14, states that the active layer includes an enzyme immobilized into an electrically conducting support member which has a porous layer of resin-bonded carbon or graphite particles. A finely divided platinum group metal is intimately mixed, or deposited, or adsorbed onto the surface of the individual particles prior to bonding to form the layer. An enzyme is then immobilized or adsorbed onto a porous layer of resin bonded platinized carbon particles. Furthermore, column 14, lines 43-46, states that carbon powder has functional groups, such as carboxylate, amino, and sulfur-containing groups, on the surface, as opposed to the more vitreous and glassy carbons. These groups are not organic groups like alkyl groups or aromatic groups. In addition, column 14, lines 51-53, states that platinum may be deposited on the carbon particles in any convenient fashion (for example, vapor phase deposition, electrochemical deposition, or simple adsorption).

The claimed invention includes five independent claims. Each of these claims recites the specific feature that at least one conductive modified particle is present.

As stated earlier, Maley et al. describes that a platinum group metal is adsorbed or deposited onto the surface of the carbon black, and wherein the enzyme is adsorbed onto the platinum group metal. Therefore, Maley et al. does not teach or suggest that the conductive modified particles include carbon products, wherein the carbon products or colored pigments have attached at least one

organic group. The enzyme in Maley et al. is only adsorbed onto the platinum group metal, and not to any pigment or carbon product. Therefore, Maley et al. does not teach or suggest the claimed invention.

With respect to claim 41 which recites, in part, that at least one organic group is directly attached to the particles, Maley et al. simply does not teach or suggest a direct attachment of an organic group onto the conductive particles. Therefore, Maley et al. does not teach or suggest claim 41 of the present application.

With respect to claim 9, which recites, in part, that the conductive modified particles are at least a partially-coated carbon black, Maley et al. does not teach or suggest that the conductive modified particles are at least a partially coated carbon black. In fact, Maley et al., at columns 14 and 15, describes that platinum is deposited on the carbon particles. Therefore, the platinum of Maley et al. coats the carbon black. Maley et al. does not teach a carbon black coating the conductive particles as recited in claim 9 of the present application.

With respect to the Examiner's argument that Maley et al. describes an aggregate comprising carbon or graphite particles and finely divided platinum group metals either deposited or adsorbed onto the carbon or graphite particles, which constitute an aggregate comprising a carbon phase and a metal-containing phase, it is important for the Examiner to appreciate that the finely divided platinum group metals either mixed, deposited, or adsorbed onto the carbon or graphite particles, do not constitute an aggregate comprising a carbon phase and a metal-containing species phase. The aggregate comprising a carbon phase and a metal-containing species phase has multiple phases, which are part of the same aggregate and which are not considered different particles that are bonded together. The aggregate is a co-fumed type product. See the definition and explanation in the present application. Accordingly, this rejection should be withdrawn.

At page 2 of the Office Action, the Examiner rejects claims 1, 3, 6, and 8 under 35 U.S.C. §102(e) as being anticipated by Dai et al. (U.S. Patent No. 6,528,020 B1). According to the Examiner, Dai et al. describes a sensing apparatus comprising conductive modified particles (carbon nanotubes) having at least one organic group attached, such as an immobilized enzyme, to the particles. The Examiner also asserts that Dai et al. also describes that the carbon nanotubes may be coated with metal particles. For the following reasons, this rejection is respectfully traversed.

Dai et al. relates to carbon nanotube devices. In particular, Dai et al. describes a nanotube device that provides a sensor. According to Dai et al., gold is deposited on the nanotube by evaporation. Additionally, Dai et al. describes a thiol-coated-gold-decorated film device, wherein the gold particles are first evaporated onto the nanotube film, followed by forming a monolayer of thiol having a carboxylic functional group to the gold particles. As emphasized in Dai et al., at column 5, lines 54-57, gold particles are first evaporated onto the nanotube film; therefore, Dai et al. does not teach or suggest that the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof. Dai et al. only describes attaching a monolayer of thiol with a carboxylic functional group to the gold particles, and not to the carbon nanotube.

With respect to claim 41 which recites, in part, that at least one organic group is directly attached to the particles, Dai et al. simply does not teach or suggest direct attachment of an organic group onto the particles. Dai et al., at column 5, lines 55-57, describes forming a monolayer of thiol with a carboxylic functional group to the gold particles. In fact, it is well known to one skilled in the art that thiol, which has a sulfur group, has a tendency to attach to metals, such as gold particles, via its sulfur group. Therefore, at best, in Dai et al., the organic group is somehow attached to the gold particles by the sulfur group of the thiol. Thus, Dai et al. does not teach or suggest having at

least one organic group directly attached to the conductive particles. Accordingly, this rejection should be withdrawn.

At page 3 of the Office Action, the Examiner rejects claims 1, 10, and 12-16 under 35 U.S.C. §102(e) as being anticipated by Snow et al. (U.S. Patent No. 6,221,673 B1). According to the Examiner, Snow et al. describes a sensing apparatus having a layer of conductive modified particles, wherein the apparatus is electrically connected to an electrical measuring apparatus, wherein the conductive modified particles include conductive particles having at least one organic group. For the following reasons, this rejection is respectfully traversed.

Snow et al. relates to materials, methods, and apparatus for the detecting and monitoring of chemical species. More specifically, Snow et al. relates to a plurality of particles in a close-packed orientation, wherein each of the particles is an extremely small cluster of conductive metal atoms that form a metallic core surrounded by a thin ligand shell of relatively non-conductive material chemically bonded to the core. According to Snow et al., the encapsulating ligand shell is an organic, inorganic, or combined organic/inorganic substance. Furthermore, the ligand molecule typically includes a head/tail-type structure. The head is a functional group possessing a bonding interaction with metal atoms in the core surface, and the tail has a structure and composition designed to provide additional stabilization of metal clusters against irreversible agglomeration. Furthermore, the ligand shell substance is a functionalized organic compound, such as a thiol and amine.

Snow et al. does not teach or suggest that the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof, as recited in claim 1 of the present application.

With respect to claim 41, as stated above, it is well known to one skilled in the art that thiol,

which includes a sulfur group, has a tendency to attach to metal particles/substances via its sulfur group. Therefore, the functionalized organic compound, such as a thiol of Snow et al., is not directly attached to the conductive particles. Thus, Snow et al. does not teach or suggest the claimed invention. Accordingly, this rejection should be withdrawn.

At page 5 of the Office Action, the Examiner rejects claims 2, 5, and 11 under 35 U.S.C. §103(a) as being unpatentable over Maley et al. The Examiner indicates that Maley et al. does not specifically describe an array of sensors, wherein the array comprises two or more sensors. However, the Examiner asserts that the use of a plurality of sensors arranged in an array configuration is well known in the art. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate an array of sensors within the sensing apparatus of Maley et al. in order to facilitate the detection and monitoring of a plurality of different chemical species within an environment. Furthermore, with respect to claims 5 and 11, the Examiner asserts that it is well known in the art that carbon black is a pigment material. For the following reasons, this rejection is respectfully traversed.

The arguments set forth above with respect to Maley et al. apply equally here. Furthermore, to emphasize, Maley et al. simply does not teach or suggest that the carbon products or colored pigments having attached at least one organic group in a sensor. Furthermore, with respect to the Examiner's assumption that it would be obvious to a person of an ordinary skill in the art to incorporate an array of sensors even though Maley et al. does not show such an array, this conclusion is an exercise of hindsight by the Examiner. As admitted by the Examiner, Maley et al. does not teach or suggest a plurality of sensors and it would be an unfair assumption on the part of the Examiner to assume that one skilled in the art could operate the sensor of Maley et al. as a plurality of sensors. Not every sensor can operate as a plurality of sensors arranged in an array

configuration. Thus, the applicants respectfully disagree with the Examiner's position on this matter, and since the Examiner has not provided any cited art that shows a plurality of sensors which also contains the limitations of claims 2, 5, and 11, this rejection is also respectfully traversed for this reason alone. Accordingly, this rejection should be withdrawn.

At page 6 of the Office Action, the Examiner rejects claims 2 and 17-21 under 35 U.S.C. §103(a) as being unpatentable over Snow et al. With respect to claim 2, the Examiner indicates that Snow et al. does not specifically teach an array of sensors, wherein the array comprises two or more sensors. However, the Examiner, again, states that the use of a plurality of sensors arranged in an array configuration are well known in the art. With respect to claims 17 and 18, the Examiner states that Snow et al. describes that the sensitivity of the apparatus can be manipulated by varying, for example, the ligand component or metal core size and type, etc. Furthermore, according to the Examiner, Snow et al. describes that the conductive modified particles for each sensor can be different from each other; therefore, each sensor would inherently have a different response for the same analyte with a detector that is operatively associated with each sensor. Additionally, the Examiner asserts that Snow et al. describes that the sensing apparatus measures a time response indicating a variation in resistivity upon exposure to various sample vapors. Therefore, the method recited in claims 19-21 would have been obvious to a person of ordinary skill in the art. For the following reasons, this rejection is respectfully traversed.

With respect to claim 2, the arguments set forth above with respect to Snow et al. apply equally here.

Furthermore, with respect to the Examiner's assumption that it would be obvious to a person of an ordinary skill in the art to incorporate an array of sensors even though Snow et al. does not show such an array, this conclusion is an exercise of hindsight by the Examiner. As admitted by the

Examiner, Snow et al. does not teach or suggest a plurality of sensors and it would be an unfair assumption on the part of the Examiner to assume that one skilled in the art could operate the sensor of Snow et al. as a plurality of sensors. Not every sensor can operate as a plurality of sensors arranged in an array configuration. Thus, the applicants respectfully disagree with the Examiner's position on this matter, and since the Examiner has not shown cited art that shows a plurality of sensors which also contains the limitations of claims 2, 5, and 11, this rejection is also respectfully traversed for this reason alone.

With respect to claims 19-21, as stated above, claim 19 recites that the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof. As stated earlier, Snow et al. simply does not teach or suggest that the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof. Accordingly, this rejection should be withdrawn.

At page 7 of the Office Action, the Examiner rejects claims 6 and 7 under 35 U.S.C. §103(a) as being unpatentable over Maley et al. in view of Dai et al. The Examiner indicates that Maley et al. does not specifically teach the incorporation of carbon nanotubes for sensing. However, the Examiner states that Dai et al. describes the use of carbon nanotubes in a biological sensor, wherein biological molecules, such as an enzyme, can be attached to the nanotube. In addition, according to the Examiner, both of the disclosures of Dai et al. and Maley et al. are directed to sensing devices for detecting glucose. Consequently, a person of ordinary skill in the art would have recognized the suitability of incorporating the teachings of Dai et al. with the sensing apparatus of Maley et al. for the intended purpose of facilitating the effective sensing

operation of a biological sensor. For the following reasons, this rejection is respectfully traversed.

The arguments set forth above with respect to Maley et al. and Dai et al. apply equally here. Furthermore, it is important for the Examiner to appreciate that the multiple phase aggregates of the claimed invention, as recited in claim 7 of the present application, include at least one silicon-containing species phase at or near the surface of the aggregate (but part of the aggregate) and/or within the aggregate. The aggregate is a co-fumed product. The aggregate is not a coating on a particle. Again, see the definition and description in the present application. Neither Maley et al., Dai et al., nor the combination thereof, teaches or suggests an aggregate comprising a carbon phase and a silicon-containing species phase. Furthermore, it is unlikely that Maley et al. and Dai et al. can be combined since the sensors are very different from each other. Dai et al., as indicated above, coats nanotubes with gold, whereas Maley et al. uses platinized carbon powder particles. The technologies are very different and it would be quite difficult to have someone combine these technologies without the improper use of hindsight. Accordingly, this rejection should be withdrawn.

At page 8 of the Office Action, the Examiner rejects claims 22-24, 27-29, and 31-40 under 35 U.S.C. §103(a) as being unpatentable over Lewis et al. (U.S. Patent No. 5,571,401) in view of Dai et al. The Examiner asserts that Lewis et al. describes a sensing apparatus comprising a first and second sensor electrically connected to an electrical measuring apparatus, wherein the first sensor comprises a region of nonconducting organic polymer material and a region comprising conductive particles, such as carbonaceous materials, and an electrical path through the regions of nonconducting material and conductive particles. The Examiner indicates that Lewis et al. does not specifically teach that the conductive modified particles include

conductive particles having at least one organic group attached to the particles. According to the Examiner, Dai et al. describes the use of carbon nanotubes in chemical sensors. Dai et al. further describes that the nanotubes can be physically or chemically modified, so as to be tailored for a particular sensing application. The Examiner further asserts that, as evidenced by Dai et al., organic polymers can be attached or deposited onto the nanotubes and thereby serve as effective sensing agents. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the teachings of Dai et al. with the sensing apparatus of Lewis et al. With respect to claim 28, the Examiner asserts that Dai et al. describes that the nanotubes may contain silicon and that the nanotubes may be semiconducting. With respect to claim 29, the Examiner asserts that Dai et al. describes that carbon nanotubes may be coated with metal particles. With respect to claim 32, the Examiner asserts that it is well known in the art that carbon black is a pigment material and that Dai et al. describes the incorporation of various polymers and a thiol functional group. For the following reasons, this rejection is respectfully traversed.

Lewis et al. describes sensors having conventional conducting and non-conducting materials arranged in a matrix of conducting and non-conducting regions. These sensors are conventional in nature. However, the claimed invention differs significantly from Lewis et al. As set forth in claim 22 of the present application, the sensor includes a layer comprising conductive modified particles. The modified particles of the claimed invention can be, for instance, conductive particles having at least one organic group attached to the particles. The wide variety of conductive particles, the specific structural details of the conductive modified particles, and the methods of making such particles are set forth at great length in the application, for instance, at page 7, line 18 - page 12, line 21, and in the publications or documents incorporated by reference therein. Other detailed examples of organic groups that can be

attached are found throughout the application. For instance, the use of polymeric groups is described at page 18, line 1 - page 19, line 24 of the present application.

By contrast, Lewis et al. does not teach the use of conductive modified particles as shown in the present application. While there is an isolated reference to carbon black in Lewis et al. at col. 4, no mention of organic groups being attached to these particles are made. The species listed in Lewis et al., at cols. 3 and 4, are varied, but the Examiner has not identified any specific reference to the kind of modified particles described in the present application. The carbon black of Lewis et al. is a conventional carbon black. Furthermore, Lewis et al. does not teach or suggest that the conductive particles having at least one organic group attached to the particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof.

The arguments set forth above with respect to Dai et al. apply equally here. In summary, Dai et al. does not teach or suggest conductive particles having at least one organic group attached to the particles wherein the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof. Furthermore, the multiphase aggregates of the claimed invention include at least one silicon-containing region concentrated at or near the surface of the aggregate (but part of the aggregate) and/or within the aggregate. Dai et al. simply does not teach or suggest an aggregate having carbon phase and a silicon-containing species phase. Similarly, Dai et al. only describes that the gold is deposited on the nanotube by evaporation. Such a process does not create "an aggregate comprising a carbon phase and a metal-containing species phase" as that term is used in the present application.

Even if one skilled in the art were to combine Lewis et al. and Dai et al., the combination

of the two references does not teach or suggest conductive particles having at least one organic group attached to the particles, wherein the conductive modified particles include carbon products having attached at least one organic group, colored pigments having attached at least one organic group, or combinations thereof. Furthermore, the combination of the two references does not teach or suggest that at least one organic group is directly attached to the particles. In fact, as stated above, the thiol group of Dai et al. is applied to the gold particles. Therefore, Dai et al. simply does not teach or suggest direct attachment of at least one organic group to the carbon product or pigment. Accordingly, this rejection should be withdrawn.

At page 10 of the Office Action, the Examiner rejects claims 25, 26, and 30 under 35 U.S.C. §103(a) as being unpatentable over Lewis et al. in view of Dai et al. and further in view of Foulger et al. (U.S. Patent No. 6,315,956 B1). The Examiner indicates that neither Lewis et al. nor Dai et al. specifically teach that the conductive particles comprise carbon black having attached at least one organic group. However, the Examiner states that Foulger et al. describes the use of conductive filler materials comprising, *inter alia*, carbon black and carbon nanotubes, within an electrochemical sensor, in which the sensitivity and dynamic range of the electrochemical sensor is highly dependent on the conductive filler material. Therefore, the Examiner concludes that a person of ordinary skill in the art would have recognized the functional equivalence of carbon black and carbon nanotube materials, as a particulate conductive or filler material used in sensing applications. For the following reasons, this rejection is respectfully traversed.

The arguments set forth above with respect to Lewis et al. and Dai et al. apply equally here.

Foulger et al. relates to an electrochemical sensor made from conductive polymer

composite materials and methods of making same. According to Foulger et al., the conductive filler material may be any suitable material exhibiting conductivity, and should have a chemical structure which results in an inherently high conductivity with an affinity to develop a strong network. The conductive filler may be selected from the group consisting of carbon black, graphite, metal metallic particles, intrinsically conductive polymers, carbon fiber, nanotubes, and mixtures thereof. Foulger et al., however, does not teach or suggest that the conductive modified particles include carbon black having attached at least one organic group. No discussion of carbon blacks having attached at least one organic group exists in Foulger et al. In fact, Foulger et al. merely states that the carbon black can be part of the polymer blend used to form the electrochemical sensor. Merely putting carbon black in a polymer blend is not at all the same as attaching an organic group onto carbon black. There is no teaching or suggestion in Foulger et al. that any part of the polymer actually attaches onto the carbon black. Thus, Foulger et al. merely relates to a conventional polymer blend which includes a variety of components. Clearly, this is quite different from the claimed invention. It is respectfully noted that there is no mention to the undersigned's knowledge of any attachment of any type of chemical group onto the filler. If this understanding is correct, then this rejection cannot possibly stand. Furthermore, Dai et al. only describes an organic group attached to a metal and not a carbon black. Therefore, the combination of the references does not teach or suggest a claimed invention. Accordingly, this rejection should be withdrawn.

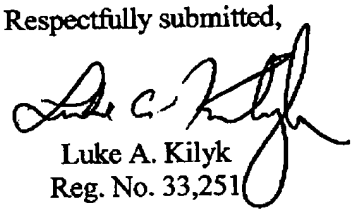
CONCLUSION

In view of the foregoing remarks, the applicants respectfully request the reconsideration of this application and the timely allowance of the pending claims.

If there are any other fees due in connection with the filing of this response, please charge

the fees to Deposit Account No. 03-0060. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such extension is requested and should also be charged to said Deposit Account.

Respectfully submitted,



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